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ECOSYSTEM MANAGEMENT: ACHIEVING THE NEW LAND ETHIC

INTRODUCTION

> *No important change in human conduct is ever accomplished without an internal change in our intellectual emphases, our loyalties, our affections, and our convictions.*
>
> Aldo Leopold, The Ecological Conscience, 1947

The two largest federal land management agencies, the USDI Bureau of Land Management (BLM) and the USDA Forest Service (the agencies) recently adopted the principles of ecosystem management to guide management of federal lands. Many segments of the general public and many employees of the two agencies greet the move toward an ecosystem approach to management in similar manners -- with anxiety, skepticism, or confusion. Anxiety and skepticism are provoked by fear of change and a pervasive distrust of all large, government sponsored enterprises. Time will show if these reactions are warranted. Public confusion over the ecosystem management concept is fueled by the lack of discussion about the meaning and implications of ecosystem management.

This paper has two purposes: 1) to describe distinctions between ecosystem management and traditional agency approaches to administration of federal lands and 2) to examine the challenges and opportunities presented by implementation of ecosystem management. The principles of ecosystem management, as defined

by BLM, are described within *Ecosystem Management in the BLM: From Concept to Commitment* (the "concept paper"). This paper references and advances themes discussed within the concept paper. However, this paper does not represent proposed or existing agency policy. It is simply intended to facilitate discussion among the public, federal land management agencies, and Congress as the agencies move toward implementation of ecosystem management.

ECOSYSTEM MANAGEMENT: WHAT IS IT?

Ecosystem management is the integration of ecological, economic, and social principles to manage biological and physical systems in a manner that safeguards the ecological sustainability, natural diversity, and productivity of the landscape. The following principles are designed to guide BLM's implementation of ecosystem management:

- Sustain the productivity and diversity of ecological systems
- Gather and use the best available scientific information as the cornerstone for resource allocations and other land management decisions
- Involve the public in the planning process and coordinate with other federal, state, and private land owners
- Determine desired future ecosystem conditions based on historic, ecologic, economic, and social considerations
- Minimize and repair impacts to the land
- Adopt an interdisciplinary approach to land management
- Base planning and management on long-term horizons and goals

- Reconnect isolated parts of the landscape
- Practice adaptive management

Ecosystem management is not a new agency strategy, initiative, or management process. Rather, it represents a fundamental change in the way the agencies view and manage federal lands. As Allan Thomas notes in the preceding article, "ecosystem management is a state of mind" and can be initiated without changes in budgets, staffing, and boundaries. However, legal, administrative, cultural, and technical assumptions underlie existing agency resource management principles. As a fundamentally new management philosophy, ecosystem management will require the agencies, Congress, and the public to examine and perhaps revise some of the assumptions, policies, and procedures that have shaped traditional approaches to management of the federal lands.

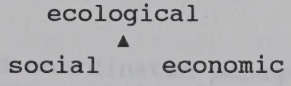
RESPECTING LIMITS

Ecosystem management can be used to justify any number of administrative processes, from reorganization to budget restructuring. Many justifications (e.g., ecological sustainability is good for humans) and manifestations (partnerships, interdisciplinary teams, agency budget restructuring, etc.) can illustrate the principles of ecosystem management. They do not, however, define the concept. At its root, ecosystem management involves providing values, products, and services from the land so long as associated activities are

conducted within the limits of ecological sustainability. Expressed another way, ecosystem management entails setting limits on use of the land.

No-one likes to talk about limits. It is almost unethical, if not un-American. However, this is the simplest distillation of the ecosystem management concept: *ecosystem management is about setting limits on land use in order to maintain ecological sustainability.*

Many have tried to describe the ecosystem management concept in a manner analogous with the graphic below:



The philosophy behind this graphic merely proceeds with traditional ways of looking at natural resource management issues. Economic, ecologic, and social factors do not share power in some form of ecosystem triumvirate. Ecosystem management is not a democracy. It more closely resembles an autocracy. To embrace the ecosystem management concept is to accept that ecological factors such as maintaining biological diversity, ecological integrity, and resource productivity dictate strict limits on social and economic uses of the land.

Human use has shaped the condition of the land for centuries. Today, society can harness technology to fundamentally change the

forms and functions of entire ecosystems almost overnight. Recognizing limits to use and acknowledging that we often lack the ability to predict a system's response to management activities are critical points of departure for the ecosystem management concept.

SETTING OBJECTIVES

Multiple Use

Objectives for management of the federal lands are strongly influenced by two legal mandates -- multiple use and sustained yield. The Federal Land Policy and Management Act (FLPMA) includes the following definition of "multiple use" (43 USC 1702(e)).

> ... [H]armonious and coordinated management of the various resources without permanent impairment of the productivity of the land and the quality of the environment with consideration being given to the relative values of the resources and not necessarily to the combination of uses that will give the greatest economic return or the greatest unit output.

Traditional interpretations of multiple use often emphasize commodity production, commercial use, and intensive development of individual components of the landscape at the expense of "harmonious and coordinated management" of *resources*. Emphasis on the use-aspect of multiple use often leads to unsustainable commodity production levels that jeopardize native species of flora and fauna. For example, prior to lawsuits and several court ordered injunctions against the agencies, the allowable

sales quantity of timber (ASQ) from Pacific Northwest forests that contain Northern spotted owl habitat was projected at 5 billion board feet per year. After an interagency Forest Ecosystem Management Assessment Team (FEMAT) was convened by President Clinton in 1993 to factor in threatened and endangered species viability requirements, the recommended ASQ fell to 1.2 billion board feet per year.

Ecosystem health and environmental quality are sometimes perceived as ancillary concerns to commodity production for two reasons. First, land managers are often unaware of the incremental and cumulative changes to ecosystem health that result from soil disturbing activities such as timber harvest, livestock grazing, and mining. Second, objectives for market valued products such as timber and forage are either targeted or strongly influenced by politicians expected to deliver a steady flow of goods and services from federal lands to local constituents. In the latter scenario, management objectives developed through agency land management plans are designed to expedite the development, extraction, and/or production of resources on public lands. Uses and values such as wildlife and fish habitats, cultural, scenic, and aesthetic resources are often viewed as constraints or mitigation for activities designed to maximize commodity production.

Emphasis on the use aspect of resource management often compels

the agencies to parcel out sections of federal land to the most politically connected or the most successfully litigious interest groups. The landscape frequently resembles a mosaic of special interest demands -- significant grazing allotments, complemented by off-road-vehicle areas, adjoined by wilderness, surrounded by extensive timber harvest management units, with a Wild and Scenic River running through it all. The strategy of partitioning the land in an effort to satisfy multiple competing interests places the agencies in an untenable position. By managing uses, rather than ecological systems, the agencies are either positioned as a foil for disagreements between multiple competing interests or as lightning rods for lawsuits.

All of the above-mentioned activities and designations represent valid uses of the federal lands, however, the sum of these uses can jeopardize the sustainability of the land. The first priority of the agencies under the ecosystem management framework is to ensure that land use allocations remain within the limits of ecological sustainability. In order to determine appropriate land use allocations, agency managers should work closely with researchers, scientists, and biologists to better understand the effects of management activities on the land.

Sustained Yield

The second precept that influences the manner by which agencies set resource management objectives is "sustained yield." Sustained yield is defined by FLPMA as:

> ... the achievement and maintenance in perpetuity of a high level annual or regular periodic output of the various renewable resources of the public lands consistent with multiple use.

The intent behind the sustained yield concept is understandable. Fluctuations in the output of goods and services can have a deleterious effect on local communities dependent on commodity production from the federal lands. Unfortunately, the "perpetuity" aspect of sustained yield sometimes takes a backseat to the "high level or regular periodic output" element of the term. The sustained yield concept values resources for their ability to achieve a politically, socially, or economically defined level of productivity. However, federal land management agencies may never be able to consistently predict the long-term "productive" capacity of ecological systems or make them conform to socio-economic issues and demands.

Although this is considered heresy in some sectors, the very concept of sustained yield may be illusory. Natural events such as drought, flood, and fire and anthropogenic effects on the landscape will forever thwart the ability of the agencies to predict a sustained level of resource production. Federal land management agencies and Congress should recognize that the sustained production commodity yields may actually preclude maintaining ecological sustainability, and vice-versa.

The ecological systems that the agencies attempt to define, model, and manage constantly evolve over time while socio-

economic objectives generally remain fixed (unless affected by extraordinary measures such as lawsuits or injunctions). Land managers are confronted with a fundamental dilemma: achieve socio-economic objectives as described in the land use plan while maintaining ecological sustainability. Achieving the first objective often prevents accomplishing the second.

Sustained yield principles require management of resource uses to arrive at a predetermined political or economic level of productivity -- natural resources are managed and marketed as commodities or economic outputs. On the other hand, ecosystem management works to ensure long-term ecological integrity and sustainability while conserving biological diversity so that future generations may continue to derive social, economic, cultural, and aesthetic benefits from the land. Herein lays a key element of the ecosystem management concept: short-term socio-economic gains may be sacrificed in the interest of maintaining ecological sustainability and long-term productivity.

Adaptive Management

Many of the cumulative effects of management activities on public lands that led to degraded aquatic and riparian systems; less productive rangeland conditions; fragmented plant, animal, and fish habitats; and forest health problems occurred prior to the adoption of the multiple use and sustained yield concepts. In fact, the implementation of multiple use and sustained yield have helped to improve the condition of some resources. For example,

in 1936, 1.5% of the public range was classified in excellent condition, 14.3% in good condition, 47.9% in fair condition, and 46.3% in poor condition. By 1992, BLM notes that conditions on the public rangelands had improved to the point that 4% were considered in excellent condition, 34% in good condition, 40% in fair condition, 15% in poor condition, and 7% as unclassified. In spite of improved management practices, native species of flora and fauna continue to decline. For this reason, the ecosystem approach to management is inherently cautious and conservative.

The Watershed Analysis procedure envisioned by FEMAT is representative of the "cautious approach" required by ecosystem management. For example, until an analysis deems additional uses appropriate, soil disturbing activities within critically important riparian areas are extremely restricted. Pending the findings of an interdisciplinary Watershed Analysis team, more permissive activities can be allowed so long as watershed integrity is preserved.

The Watershed Analysis concept embraces the principles of adaptive management. For the purposes of this paper, adaptive management is defined as:

> A management process that includes the following steps: an assessment to determine status and trend of a given ecosystem; delineation of measurable ecosystem condition objectives; creation of management direction to facilitate accomplishment of objectives; and development of a comprehensive monitoring plan to evaluate achievement of

objectives.

Through adaptive management, as defined above, objectives become the focus of subsequent monitoring efforts designed to measure movement toward or away from stated resource condition objectives. Management direction is regularly refined based on monitoring, natural limits and events, and site-capabilities.

Under the ecosystem management framework, providing healthy, diverse, and sustainable ecological systems frames the decision space from which resource allocations are derived. The ecosystem management concept is predicated on the idea that unless the agencies safeguard ecological sustainability, they cannot ensure *any* consistent level of productivity from the federal lands. In order to maintain ecological sustainability, the agencies should commit to developing sound, long-term ecological objectives prior to defining socio-economic objectives.

SCIENCE BASED DECISION-MAKING

Land mangers require an informed understanding of the status, trend, and condition of the land prior to making land use allocations. In the past, due to limited resources and different priorities, the agencies often authorized land uses with insufficient data to support their decisions. For example, the National Research Council, the research branch of the National Academy of Sciences recently found that current scientific data on the condition of the nation's rangelands is so fragmented and inconsistent that it does "not allow investigators to reach

definitive conclusions about the state of rangelands."

Under the ecosystem management paradigm, the agencies' first priority is to maintain healthy, diverse, and sustainable ecological systems. This entails gathering information on the condition and trend of the land prior to allocating resource uses. Maintaining biological diversity and ecological sustainability should not be viewed as mitigation or constraints on commodity production. Conserving the biotic integrity of the land is the overriding objective of ecosystem management. Permitted activities on the land must demonstrate that they will not compromise ecosystem health and biological diversity. The burden of proof is placed squarely on those uses that degrade ecological sustainability, including livestock grazing, timber harvest, road construction, mining, and some recreation. Implementing ecosystem management will not alleviate the need for mangers to make occasional local "trade-offs" in order to accomplish social or economic goals. Resource trade-offs are a fact of land management, however, they should represent the exception not the rule.

Ecosystem management requires that land use decisions are based on an understanding of the condition of the land and its response to management activities. Multiple federal agencies including BLM, Forest Service, Environmental Protection Agency (EPA), Fish and Wildlife Service, and others are presently working to develop

ecological assessment protocols for broadly defined ecoregions across the United States. These assessments will provide a contemporary baseline from which future management actions can be evaluated. In addition, the assessments should provide information on the historic condition of the land; evaluate the effects of natural events and management activities that influence ecosystem trends, productivity, and sustainability; and provide management with alternatives for future landscape conditions based on ecological, economic, social, and cultural demands.

The agencies, particularly BLM, presently lack the organizational structure and many of the appropriate disciplines to support the commitment to science-based decisionmaking. Although the Forest Service is equipped with eight regional Research Stations supported by satellite offices with expertise in rangeland, forestry, aquatic, and shrub sciences, their link to management of the National Forest System is often tenuous.

Federal land management agencies should work with EPA, universities, and states to integrate existing research and technical capabilities into permanent ecoregion technical teams to provide the latest and best available science to federal, state, and private lands. These interagency teams could also: facilitate the transfer of information among agency field offices and other federal and state management units; provide a regional

station for the distribution of information by the nascent National Biological Survey (NBS) to agency field offices; define regional monitoring protocols; provide research and data needs to NBS; integrate efforts with field offices, and other federal, state, and private research units to determine the status and trend of the land; and assist field offices to implement and monitor regional initiatives such as rangeland reform and PACFISH (Pacific Salmon and Steelhead Recovery Strategy).

The staffs of these regional technical centers should be comprised of "scarce skills" specialists and experts that can provide the agencies, states, and interested publics with information concerning the condition of the land and its response to management activities. At a minimum, the interagency teams should include the following skills: aquatic, range, and forest ecologists; plant ecologists; conservation biologists/population geneticists; hydrologists; and soil scientists/geomorphologists. Specialists with specific expertise may be required depending on regional issues. Other skills that may be needed include economists, statisticians, computer scientists, cultural resource specialists, and forest ecologists. Many of these skills are presently in short supply within the federal land management agencies. The interagency technical teams should be insulated from administrative duties and competitively selected from within agencies, academia, and private industry.

INTERAGENCY COORDINATION

Ecosystems occur at multiple geographic scales and change and evolve in response to both human influence and natural events. The only boundaries to an ecosystem are those that we choose to, or are capable of, recognizing. However, the acceptability of disturbance at one scale must be considered for its effects over time and in the context of the larger ecosystem. Agency administrative boundaries and state lines typically do not correspond to noticeable ecological boundaries such as watersheds or landforms and federal agencies are rarely the sole managers of large, self-contained ecological systems. Thus, the management actions of one agency can compromise the health of adjoining lands.

Consider the following scenario, for example. The Forest Service manages the headwaters of a watershed; downstream, BLM manages lands along the mainstem of the river. BLM determines that the mainstem section of the river possesses "outstandingly remarkable" fisheries habitat. BLM decides to designate the river for special management under the provisions of the Wild and Scenic Rivers Act. Meanwhile, the Forest Service has contracted a timber sale in the headwaters of the watershed and cuts a road to the site. Following harvest, a large flood event occurs and large amounts of sediment are washed from the road and the slopes of the recently harvested headwater area to the mainstem section of river managed by BLM. The fisheries habitat is degraded and

the outstandingly remarkable values of the river are lost. In accordance with the law and with agency planning regulations, the Forest Service conducted an analysis to determine the effects of the timber harvest. However, the analysis only evaluates the effect of actions *within the borders of the forest*. This is a not atypical example of how the "ecologically arbitrary" delineation of administrative boundaries can undermine agency planning at all levels, from endangered species issues to watershed management.

The agencies have developed coordinating mechanisms to initiate interagency efforts such as rangeland reform and PACFISH. However, variations among the agencies' legislative mandates, administrative procedures, and planning regulations sometimes confound interagency planning efforts. For example, during the mid to late 1980s, the agencies took divergent paths on methods of managing old growth forests containing habitat for the threatened Northern spotted owl. The difference in management approaches was due in part to the existence of definitive Forest Service planning regulations requiring individual forests to maintain viable populations of native species -- regulations BLM lacked.

The Draft Supplemental Environmental Impact Statement (DSEIS) developed by the interagency FEMAT may finally resolve the spotted owl/old growth controversy. The FEMAT report provides an

example of the level of coordination necessary to manage broad expanses of land involving multiple agencies. In drafting the DSEIS, a multi-disciplinary, interagency team was convened to develop a series of alternatives for management of old growth forests in the Pacific Northwest. FEMAT's preferred alternative includes management prescriptions for commodity production that are considered unlikely to compromise the viability of native flora and fauna such as the Northern spotted owl.

The FEMAT effort is symbolic of the type of crisis management that the ecosystem approach is designed to offset. DSEIS alternatives were developed in response to lawsuits and judicial injunctions against the agencies that nearly halted timber harvest from old growth forests on federal lands in the Pacific Northwest. In order to avoid the social displacement and economic repercussions typical of "trainwrecks" such as the spotted owl/old growth controversy, the agencies must continue to integrate planning and management at all levels.

The agencies should coordinate administrative processes and planning regulations to streamline interagency coordination and employ comparable data standards and resource classification systems to simplify information exchange. Agency management objectives should be integrated from a watershed, landform, or some other ecological perspective. In order to safeguard sustainable ecosystems, ecological, economic, and social factors

should be considered to determine appropriate resource uses, cost of uses, products, and services from the federal lands.

A more permanent and effective means of facilitating an ecological approach to management of the federal lands abides in Congress. Presently, none of the federal land management agencies' utilize the same administrative framework to manage field units. Forest Service, Park Service, EPA, and Fish and Wildlife Service all employ distinct regions to manage field units. BLM operates within state lines. Interagency coordination would be quickly enhanced were all federal land management agencies to recognize and operate under the same ecologically-based regions. This would require abolishing state lines as agency borders. Similarly, the degree of interagency coordination, and its associated costs, would be drastically reduced if the Forest Service and BLM were joined under the same legislative mandate.

THE BURDEN OF SUSTAINABILITY: IS IT ALL WORTH IT?

As the agencies approach the implementation of ecosystem management, Congress and the public should reconsider the "customer service" ethos that has traditionally driven resource management practices in the western United States. Practices rooted in policies designed to expedite settlement of the West through commodity production and resource development. No frontiers remain in the American West and much of the development has come at a great cost to the biological diversity of the

nation. We may never know the price of incremental and cumulative degradation to the landscape -- though its evidence is real and visible -- the explosive spread of noxious weeds; the multitude of threatened, endangered, and extinct species; and forest health problems. As E.O. Wilson asks, "[I]f enough species are extinguished, will the ecosystems collapse, and will the extinction of most other species follow soon afterward? The only answer anyone can give is possible. By the time we find out, it might be to late. One planet, one experiment."

Tip O'Neill once remarked "all politics is local." Most federal land use issues are as well. Agency managers live and work in communities dependent on the delivery of goods and services from the federal lands. The outdated concepts and equivocal language of the agencies' legal mandates do not empower field managers with a clear charge to maintain ecological sustainability. Thus, political and social pressure strongly influence land use allocation decisions. In the absence of solid data to support limits to land use, managers often cannot justify, or even determine, appropriate restrictions to development. Congress should make clear through new legislation or amendments to authorizing legislation, that the first priority of the agencies is to safeguard the ecological sustainability of the land.

Few developed countries enjoy the bounty of natural resources present on lands managed by the federal agencies. Goods and

services derived from federal lands insulate the country from price fluctuations in world markets and provide jobs to local communities. The wealth of resources from the federal lands provide the United States with a strategic advantage over most other industrial nations of the world. Forests, grasslands, rivers, and streams are a source of income, recreation, and spiritual renewal for millions of Americans.

The principles of ecosystem management form the philosophic underpinning of a new land ethic. A land ethic designed to safeguard ecological sustainability and biological diversity so that future generations may continue enjoy benefits from the land. The agencies, states, Congress, and the public should not presume that adoption of ecosystem management will be inexpensive or painless. Implementing ecosystem management will require the agencies to place a greater emphasis on hiring and training employees proficient in assessing and predicting the effect of management activities on the landscape. As noted above, the agencies do not presently possess many of the skills needed for such a task. Ecological assessments and increased interagency coordination will also require additional agency expenditures. As demonstrated by the FEMAT effort in the Pacific Northwest, the public can also expect that an ecosystem approach to management will check short-term use and development of federal lands in some areas. Of one thing we may be sure, long-term benefits secured by maintaining biologically diverse, healthy, and

productive ecological systems will far surpass the short term costs and sacrifices incurred by implementation of ecosystem management.